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The Role of Ge in Cluster Formation in B, Bf_2, AND Bf_3 Implanted Si Wafers after Ge Pre-Amorphization

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Introduction: Cluster formation in high dose B, BF_2, or BF_3 implanted Si wafers is an important problem in silicon doping, since it is one of the leading causes of the electrical deactivation of the dopant.

Methods and Materials: In this study, we used Ge pre-amorphized, ultra low energy B, BF_2, and BF_3 implanted Si wafers in order to probe the Ge involving clusters from a local structural point of view. Ge K-edge x-ray absorption spectroscopy (XAFS) is a powerful tool in obtaining local structural information around the Ge atom.

Results: The effects of different implant species with various implant doses and annealing conditions on the cluster formation were investigated using Ge K-edge multi-shell XAFS analysis. The concentration profiles obtained from secondary ion mass spectroscopy (SIMS) for B and Ge were correlated to the structural information obtained from XAFS analysis. Using the calculated XAFS standards for B, F, and Ge doped Si crystals, the contribution of the B and F to the Ge K-edge XAFS, and the results on the local structure of the clusters will be probed.